

INFORMATION SUBMISSION FOR NAS

December 2010

**Office Vehicle Safety Research
National Highway Traffic Safety Administration**

1.0 INTRODUCTION

The Office of Vehicle Safety Research (OVSR) consists of three Offices with seven divisions as follows:

- (1) Vehicle Research Test Center – provides timely and quality research that can be used to form the basis for new safety regulations, recall of defective vehicles, and other safety engineering objectives
 - a. Applied Biomechanics - Division conducts research and testing to examine issues relating to human response to impact and anthropomorphic test device (ATD) development
 - b. Vehicle Stability & Control - Conducts research on vehicle dynamics, stability/control, and human factors
 - c. Defects Analysis & Crashworthiness - Conducts research that supports possible new or upgrades to existing occupant protection safety standards and Provides engineering analysis and testing support to the Office of Defects Investigation

- (2) Applied Vehicle Safety Research -- reviews Study of crashworthiness safety concerns and countermeasures
 - a. Human Injury Research - Study human injury mechanisms to assess, prevent and mitigate injuries and enhance biomechanical fidelity of test device
 - b. Structures and Restraints – Study of crashworthiness safety concerns and countermeasures

- (3) Human Vehicle Performance – consists of three divisions
 - c. Human Factors/Engineering Integration - Study human-vehicle interactions to identify risk and mitigation strategies of new and existing technologies.
 - d. Intelligent Technologies Research – Research of advanced vehicle safety technologies, primarily focused on crash avoidance technologies including intelligent transportation systems and heavy trucks

The Vehicle Safety Research and Analysis program supports NHTSA's mission and DOT Safety goals by conducting motor vehicle safety research and development. Research activities concentrate on the entire spectrum of advanced pre-crash, crash and post crash vehicle safety issues and technologies. Specific research areas include vehicle structure and restraints research, human biomechanics research, crash avoidance and human factors research, and heavy vehicle and alternative fuel vehicle safety. These programs help to improve vehicle crashworthiness, understand benefits of crash avoidance technologies, decrease alcohol involvement in crashes, decrease the number of rollover crashes, improve vehicle-to-vehicle crash compatibility, and improve data systems. Ultimately, this research saves lives and reduces injuries of occupants involved in vehicle crashes. Research is performed in collaboration with research institutes, universities, manufacturers and suppliers and other entities in all the areas. Results of research are published regularly in journals, conference proceedings, the federal register and regulatory docket as well as other media.

The OVSR currently has a staff of 60 employees to accomplish its mission. This includes 6 Electrical / electronic Engineers, 24 Mechanical Engineers, 9 General Engineers, 2 Physical Scientists, and 4 Human Factors Engineers. A brief description of each division is listed below:

1.1 Safety Systems

Safety Systems conducts occupant protection research to reduce the number of fatal and serious injuries that occur in the United States each year. This research program is responsible for developing and upgrading test procedures for evaluating motor vehicle safety. Safety systems research examines new and improved vehicle design, safety countermeasures and equipment to enhance occupant safety.

Motor vehicle crashes claimed the lives of 37,261 people in the United States in 2008. In addition, approximately 2.34 million occupants suffered injuries in motor vehicle crashes. In FY 2008, passenger vehicles occupant fatalities were 26,869. The number of injured persons declined for the ninth year in a row to a total of 2,346,000 injured in 2008.

Although much progress has been made in providing increased occupant protection, research is still needed to mitigate serious and fatal injuries in frontal, side, and rollover crashes since they account for most of the deaths and serious injuries in passenger cars and light trucks and vans (LTVs). Advanced technologies and innovative developments are researched for applications that can further enhance protection for all age occupants. Activities in NHTSA's Safety Systems program specifically address the Department's highway safety fatality goals.

1.2 Biomechanics

The support provided by the continuous and long range biomechanical research activities allows development of the critical scientific links between vehicle crash characteristics and the resulting human injuries. To accomplish these goals, the science of impact biomechanics is applied for developing injury criteria to predict injury risk in automobile crashes and provide the test devices, such as crash test dummies, that accurately mimic human response and assist in the prediction of injuries in a vehicle crash. Specific focus will continue on pediatric impact biomechanics; older occupant impact tolerance and response to advanced restraints; head, brain, thoracic and abdominal impact response and the effects of restraint type on the likelihood of such injuries; and pedestrian impact response. Expansion of research in computer modeling, crash reconstruction, and advanced restraint systems assessment will broaden the knowledge of the agency and keep the research group in the forefront of impact biomechanics research.

1.3 Heavy Vehicles

Large trucks are involved in 8 percent of fatal crashes, and 12 percent of all fatalities occur in crashes involving a large truck. Additionally, heavy truck crashes tend to be more severe in terms of property damage when crashes occur. Primarily, as a result of the huge mass differential between heavy trucks and cars, which may be as much as 20 to one, approximately

76-percent of truck-related fatalities are the occupants of the other vehicles that collide with trucks.

The most effective way to attack this problem is to concentrate on countermeasures to avoid the collision in the first place, as heavy truck-car collisions dissipate the crash energy in such collisions through crush of structures of the vehicles involved. NHTSA's heavy vehicle research program supports the Agency's rulemaking efforts by developing the scientific basis for improving the safety of heavy vehicles by making them less prone to crashes through improvements in their braking, handling, and visibility characteristics; by mitigating the consequences of collisions that occur between heavy trucks and other vehicles; and improving the driving performance of truck drivers through the use of advanced technologies. NHTSA's heavy vehicle research program directly supports the Department's large truck and bus fatality goals. Heavy vehicles continue to be a significant factor in vehicle crashes. The transport of goods across the US is highly dependent on this growing fleet of vehicles. Also, motorcoaches are becoming an increasingly attractive travel mode for Americans. Research must be done to ensure the performance of these vehicles in precrash conditions and ensure the safety of occupants and other vehicles during the crash phase. This research area is needed to support the NHTSA's future efforts in heavy vehicle (tractor semi-trailer, single unit trucks, and buses (including motorcoach) safety. This research program has supported the development of revised braking performance requirements for truck-tractors, resulting in a recent regulatory change to FMVSS 121 (heavy vehicle air brakes) estimated to save 200+ lives annually. Currently the program is performing research to support agency rulemaking decisions on stability control systems which are estimated to save over 100 lives annually. In addition to applied research that supports regulatory upgrades, the program supports research of next generation safety technologies such as crash warning and avoidance systems which will support future agency regulatory decisions.

1.4 Crash Avoidance

The rapid advance of crash avoidance safety systems will radically change the design and performance of automobiles over the next 10 years. These technologies present a unique research challenge. Evaluation of driver assistance technologies, performance standards, and consumer education materials are needed to ensure that the maximum safety benefits are derived from these technologies, while providing a minimum burden to driver distraction.

Research areas include human factors, intelligent vehicle technologies for crash avoidance (light vehicle focus), and pneumatic tires. Within the human factors program, research areas include distraction and inattention, impaired drivers (e.g. alcohol), controls and displays as well as additional human factors issues associated with the interaction between the driver and the vehicle. For intelligent vehicle technologies research, areas include advanced technologies for driver assistance and warning, advanced vehicle control, driver monitoring, and vehicle communications. These systems rely completely on complex electronic control systems, which present their own challenge to ensure reliability of control systems and software. Pneumatic tire research will support agency rulemaking and consumer information programs to improve safety and fuel economy. Research tools include the National Advanced Driving Simulator (NADS), test tracks, and instrumented vehicles.

This research program is necessary to support agency priority plan in the areas of light vehicle crash avoidance, human factors/engineering integration, and pneumatic tire research; and to also develop effective public and consumer education programs for in areas such as belt usage, alcohol, and driver distraction.

This research program directly supports several critical areas of agency rulemaking and policy development related to light vehicle crash avoidance. For example, past successful research was completed on electronic stability control, which supported the agency's rulemaking effort of development and promulgation of FMVSS 126. Light vehicle stability control systems are estimated to save nearly 10,000 lives annually. In the human factors area, the program has completed a large body of research in the areas of (1) lighting and conspicuity (what do drivers need to see and be seen), (2) Driver assistance technologies (what is the best way to present safety warnings to drivers), (3) Evaluating ways to modify unsafe driving behaviors (e.g. distraction and alcohol impairment), and (4) Performing research to enhance the safety of vulnerable and at-risk populations such as teen drivers, older drivers, and blind pedestrians. In the area of pneumatic tires, the program has been successful in supporting the development and promulgation of a tire pressure monitoring standard and is currently supporting the development of additional tire safety requirements in the areas of tire aging and tire rolling resistance.

1.5 Alternative Fuels Vehicle Safety

Many manufacturers are heavily investing for near future production and marketing of hydrogen, other alternative fuel vehicles, and battery intense vehicles. As these vehicles are deployed in the fleet, their safety during refueling, recharging, and in crashes becomes an issue of paramount concern. Ensuring that alternative fuel vehicles attain a level of safety comparable to that of other vehicles requires an extensive research effort due to the many advanced and unique technologies that have previously not been tested in the transportation environment.

Additionally, the introduction of new battery technology, such as lithium ion, present new challenges previously not considered in the Federal motor vehicle safety standards. A failure to adequately address safety concerns could affect the future development of these promising technologies if a catastrophic failure were to occur.

There is no doubt that future vehicles will have a variety of power and energy systems that do not rely on internal combustion technology for power. NHTSA research must be at the forefront of the research involved in the safety and performance of these systems to best determine the performance requirements of these new systems and to support potential future rulemaking on them as well. This program area is only in its early stages and NHTSA is gathering information from any sources regarding the impending battery, stored gas and fuel cell technologies that are emerging. This advanced knowledge is helping to focus the research projects. In addition, research is reaching out to other Government agencies and stakeholders to determine the future research directions to gain additional knowledge of their activities.

Financial Information

Listed below ARE the financial resources provided to OVSR in FY-2010 and FY-2011 to support its activities:

OVSR Program Funding – FY-2010

Project	Enacted
Safety Systems	\$8,226,000-
Biomechanics	\$11,000,000-
Heavy Vehicles	\$2,115,000-
Crash Avoidance	\$8,104,000-
Alternative Fuels Vehicle Safety	\$4,498,000-
	\$33,943,000-

OVSR Program Funding – FY-2011

Project	President's Budget Request
Safety Systems	\$8,226,000-
Biomechanics	\$11,000,000-
Heavy Vehicles	\$2,115,000-
Crash Avoidance	\$8,104,000-
Alternative Fuels Vehicle Safety	\$1,00,000-
	\$30,445,000.00